Long-term Archive of the DUCK94 Nearshore Field Experiment Data

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LONG-TERM GOALS

The long-term goal of this effort is to compile and distribute data collected during the DUCK94 and SandyDuck'97 nearshore field experiments so that these data may be accessed by coastal researchers worldwide.

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OBJECTIVES

Conducted in August, September, and October 1994, DUCK94 was an intense, large-scale, multi-agency investigation of surf zone winds, waves, currents, sediment transport, and morphology within a 1 x 0.5 km region at the U.S. Army Corps of Engineers Field Research Facility (FRF) in Duck, North Carolina. DUCK94, which was a pilot for the SandyDuck '97 experiment, included 31 investigations of varying complexity, using a variety of instruments (Table 1). SandyDuck included 30 experiments . The data collected by each experiment currently reside with the associated principal investigators. Summaries of what data were collected exist, but there is no central database and no easy public access to the data. Because these experiments occurred during strikingly different conditions and since they resulted in the two most comprehensive observations of nearshore dynamics ever collected, the data have great potential for fundamentally advancing nearshore science with direct application to Navy and US Army Corps of Engineers modeling efforts.

By agreement it was resolved that experimenters' data would become publicly available three years after the completion of each experiment (1998 for DUCK94; 2001 for SandyDuck). The purpose of this project is to make these data available online and in useful formats.

APPROACH

The DUCK94/SandyDuck data include a wide variety of data types stored by the individual investigators in many different formats on a network of widely distributed computers and media. Some data sets are of wide general interest, others are not. Some of the data will be thoroughly described and quality controlled by the principal investigators, much will not be. As the data are used in more and more research projects it will continue to be refined and better understood. Because of these considerations, we have adopted and adapted a UNIX/web based data management system originally developed for the Joint Global Ocean Flux Study *(JGOFS)*. It has several features that make it desirable for this application. These are:

> The data server already exists, is freely available, customizable, and easy to administer. It is web based and easy for unfamiliar users to navigate, includes documentation pages, screen display and plotting, data searches, and links to ftp site files for direct downloading.
>
> Data can reside on the original investigator's computer system so users always access the most recent version, or it can be moved to a central server.
>
> Data can remain in its original format and be translated and delivered to each user when requested, or it can be translated once.

The JGOFS server software does have limitations. Because of Internet security concerns, it is not practical to expect each investigator to maintain a web server to allow access to their data. Consequently we are using a single server for the data. While this negates one of the original attractions, that users would always access the most recent version of the data, DUCK94 data should be well analyzed and require little if any future editing. Moving most of the data to a common server insures that the data remain online, even as interest by the collecting investigators wanes. We have also translated the original data into a common format. Translated files are columnar ASCII files

Table 1. DUCK94 Experiments

No.	Investigators	Experiment Title	Participating Months	Wave Shoaling	Nearshore Circulation	Boundary Layers	Swash Processes	Small Scale Sediments	Meso/Macro Morphology	Water Properties
1	**Beach, Holman, Sternberg**	**Sediment dynamics in the nearshore environment**	**Aug,Oct**		**X**	**X**		**X**		
3	Church, Elgar, Guza	Mine scour, burial, and migration as a function of wave and current forcing	Sep				X			
4	Drake, Smith	Nearshore sedimentary structures	Aug,Oct					X		
5	Dugan	Airborne remote sensing of the environment in the littoral zone	Oct	X	X					
6	Earle	Real-time buoy directional wave measurements for driving surf zone numerical models	Aug,Oct	X						
7	Earle, Walsh, Boyd	Scanning radar altimeter sea surface topography & high resolution directional wave measurements	Oct	X						
8	**Elgar**	**Temporal and spatial variability of the bathymetry of a natural beach**	**Aug,Oct**						**X**	
10	Graber, Shay, Haus	An investigation of surface currents and internal waves over the inner and mid-shelf	Oct	X	X					
11	**Elgar, Herbers, Guza, O'Reilly**	**Surface gravity waves and nearshore circulation**	**Aug,Oct**	**X**	**X**					
12	Haines, Gelfenbaum	Vertical structure of mean currents & turbulent stresses in the nearshore boundary layer	Aug,Oct		X	X				
13	**Hanes, Vincent**	**Near bed intermittent suspension**	**Aug,Oct**		**X**			**X**		
14	Hanes	Remote video measurement of mesoscale nearshore processes	Aug,Oct				X		X	
15	Hathaway	Rip current mapping	Aug,Oct		X				X	
16	Hay, Bowen	Sediment suspension, local morphology, and bubbles	Oct		X			X	X	X
17	**Holman, Holland, Plant**	**Foreshore dynamics**	**Aug,Oct**				**X**			
18	**Howd, Hathaway**	**Processes of shoreface profile adjustment**	**Aug,Oct**		**X**				**X**	
19	Jensen	Evolution of wave spectra in shallow water	Aug,Oct	X						
20	**Lippmann, Thornton, Stanton, Su**	**Spatial distribution of wave breaking and turbulence**	**Aug,Oct**	**X**		**X**				**X**
21	**Long**	**Wind wave frequency-direction spectral measurements**	**Aug,Oct**	**X**						
22	Miller	Longshore sediment transport during storms	Aug,Oct					X		
23	Fabre, Wilson, Earle	Wave and surf generated ambient noise measurements	Aug,Oct							X
24	**Stauble, Smith, Birkemeier**	**Sediment dynamics and profile interactions sampling experiment**	**Aug,Oct**					**X**		
25	Thornton, Dingler	Small-scale morphology in the nearshore	Aug,Oct					X	X	
26	**Thornton, Stanton**	**Suspended and bedload sediment transport**	**Aug,Oct**		**X**			**X**		
27	Trizna	Radar remote sensing of nearshore processes: bar morphology, directional wave spectra, infragravity waves, wave breaking	Aug,Oct	X	X				X	
28	Walker	Hyperspectral optical characterization of surf zone bottom/resuspended sediment	Aug					X		X
29	Werner, Elgar	Swash zone morphology: field manipulation and simulation	Jun,Sep				X		X	
30	White	Field tests of sediment transport theories	Aug,Oct		X			X		
31	Livingston, Wolf, Pasewark	Wave and surf noise measurements: supplementation	Oct							X
	Field Research Facility	**Basic environmental meteorlogical and oceanographic measurements**	**Aug-Oct**	**X**	**X**				**X**	**X**

which are MATLAB and spreadsheet compatible, making them easy to use by all users. Times have been adjusted to Eastern Standard Time and units have been converted to MKS. Identical formats have been used for similar data types collected by different investigators (mean current statistics, wave height measurements, etc.).

DUCK94/SandyDuck data can be broadly classified as four types:

1. Discrete time series samples from single-channel sensors (current component, pressure, optical backscatterance, sonic altimetry, temperature, wind speed, wind direction, etc.), usually recorded in the form of voltage analogs converted to physical units through calibration coefficients. Summary statistics in physical units are usually computed from the time series data.

2. Time sequences of one- or two-dimensional results (video-derived runup, benthic surveys, beach surveys, frequency-direction wind-wave spectra, contours of side-scan sonar images) derived by specialized processing of more rudimentary data.

3. Digital image data (camera snapshots, time-averaged images, movie loops of various processes).

4. Analyzed sediment samples, which include size distribution and composition described in text and tables, and photographs and x-ray images of core peels archived as digital images.

Not all of these types are efficiently handled by this JGOFS based system, so other web tools such as FTP and static web pages are being used to deliver those data types .

Key to the success of this effort is cooperation from the investigators to provide: online access to their data; complete information about the filenames and data formats, and thorough descriptions of the data including how it was collected, what manipulation was conducted and any quality concerns. The response has been positive with the investigators providing their data and supporting the effort.

WORK COMPLETED

During the first year, the JGOFS system was evaluated and adapted for our use. Data collected by the Field Research Facility, and by the team of Elgar, Herbers, Guza, and O'Reilly, two primary data sets, were incorporated. During this second year a preliminary version of the web site was activated, presented and demonstrated at the 1999 Fall meeting of the American Geophyical Union. This gave contributing investigators an opportunity to examine and comment on the system. Additional data sets were added and the original ones were reformated for consistency. Data included to date are bolded in Table 1. Software translators written for these DUCK94 data sets will be eventually to convert SandyDuck data. The DUCK94 data can be found at http://frf.usace.army.mil/duck94/duck94.stm.

RESULTS

The JGOFS software was evaluated, tested, and a decision was made to utilize it as the server for statistical data. The server is installed at Elizabeth City State University and data from eight of the

experiments are on line with complete documentation. Feedback on the server's data accessability and presentation will be requested for future refinements. The remaining DUCK94 data along with system refinements will be added during the third year.

IMPACT/APPLICATIONS

By making the data available to researchers worldwide it will hopefully achieve maximum utilization and permanence getting the most out of these experiments for little additional money. In addition to making these data sets available to other researchers, it will also provide high quality data for students working on Masters or PhD degrees. Based on the research accomplished following earlier, less comprehensive FRF experiments, the DUCK94 and SandyDuck data will have wide use and great potential for advancing nearshore science.

TRANSITIONS

The system is new and therefore we have not yet built a user base. We will be collecting access and web-use statistics once we are online starting October 2000.

RELATED PROJECTS

It is expected that what is learned from implementing this server will provide an improved method to deliver the 20 year archive of FRF data in addition to the DUCK94 and SandyDuck experiment data. We have also been examining other data format/delivery systems including DODS and an object oriented system being developed at NRL-Stennis using nearshore data from the FRF. One advantage of the JGOFS system we've implemented is that the data can be directly imported into the DODS format.

REFERENCES

To learn more about the JGOFS data server system see http://www1.whoi.edu/jg/dir/jgofs/